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~~RESEARCH AND DEVELOPMENT REPORT~~

LABORATORY RECORDS
1954

OPERATIONS DIVISION MONTHLY REPORT

FOR

MONTH ENDING SEPTEMBER 30, 1953

CLASSIFICATION CANCELLED
DATE JUL 13 1979 (DOE Review Order)
DECLASSIFICATION OFFICER
OAK RIDGE NATIONAL LABORATORY
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For: H. T. Bray, Supervisor
Laboratory Records Dept.
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OAK RIDGE NATIONAL LABORATORY
OPERATED BY
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
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OPERATIONS DIVISION MONTHLY REPORT

for

Month Ending September 30, 1953

by
M. E. Ramsey

DATE ISSUED

NOV 5 1953

OAK RIDGE NATIONAL LABORATORY
Operated by
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
Post Office Box P
Oak Ridge, Tennessee

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OPERATIONS DIVISION MONTHLY REPORT

SUMMARY

The activities of the Operations Division for the month ending September 30, 1953 are summarized and indexed below:

1. Lost graphite reactor operating time averaged 6.9%, compared with 8.0% for the year to date (p. 3).
2. One ruptured slug was detected and discharged without difficulty. There have been 17 ruptured slugs for the year to date, compared with 13 ruptures during 1952 (p. 3).
3. The LITR down time was 18.0%, compared with 13.8% for the year to date. The higher down time was the result of the installation of shielding for higher power operation (p. 3).
4. LITR power was increased to 3000 kw on September 2, 1953, with operation being continued at this level with no difficulty (p. 3).
5. LITR poison buildup after shutdown was slightly in excess of 2%, which is in agreement with calculations (p. 8).
6. Iodine-131 production has been difficult; the I^{131} has not been coming out of the UNH in the first distillation step (p. 11).
7. Installation of equipment in the new I^{131} cell is 40% complete; the piping is 60% complete (p. 11).
8. A total of 32,400 gal of chemical-waste concentrate containing 899 curies of beta activity was transferred to chemical-waste storage pit No. 2 (p. 12).
9. A total of 11.4 curies of beta activity was discharged to White Oak Creek, compared with 14.0 curies last month (p. 13).
10. Minor repairs have been completed on the RaLa equipment. The next RaLa run has been postponed until November 1953 (p. 14).
11. There were 942 radioisotope shipments this month, compared with 987 during August (p. 15).

REACTOR OPERATIONS DEPARTMENT

OPERATING DATA

	SEPTEMBER 1953	AUGUST 1953	YEAR TO DATE 1953
ORNL Graphite Reactor			
Reactor power			
Total accumulated (kwhr)	2,496,497	2,541,609	22,698,212
Average kw/operating hr	3,726	3,700	3,765
Average kw/24-hr day	3,467	3,416	3,464
Lost time (%)	6.94	7.70	7.99
Excess reactivity (inhr)	135	10	
Slugs discharged	105	137	915
Slugs charged	105	137	972
Product made (g)	91.11	92.76	827.58
Product discharged (g)	2.03	2.92	24.83
Low-Intensity Test Reactor			
Reactor power			
Total acumulated (kwhr)	1,763,962	1,064,392	9,324,669
Average kw/operating hr	2,989	1,728	1,651
Average kw/24-hr day	2,450	1,431	1,423
Lost time (%)	18.0	17.2	13.8
Position of No. 2 shim rod (in. out)	19.28*	25.75	

*This corresponds to approximately 3.3% excess reactivity.

REACTOR OPERATIONS

ORNL Graphite Reactor

A slug rupture (No. 124) was discovered on September 14 in channel 1559 after the slug had been in the reactor for 490 days at a temperature of about 165°C. This bonded slug was from batch 149, which was 100% beta transformed; the slug was the seventeenth from the west end of the row. For the year to date, there have been 17 ruptures, four of which were of unbonded slugs being irradiated for radioiodine production; there were 13 ruptures during 1952. The increase in rupture rate is evidence of higher metal temperatures in the reactor. These higher metal temperatures are also indicated by measurements with thermocouples and by the marked increase in rupture frequency in the rows being used for radioiodine production in which the unbonded slugs remain for about two months. The rupture rate became so high that it was necessary to reduce the number of slugs per row from 35 to 24.

The two neutron chambers used with the operating galvanometers are the flow type and are similar to those used at the LITR. An adequate signal is obtained from these chambers and they appear to be functioning properly.

The usage of experimental facilities in the ORNL graphite reactor is shown in Table 1.

Low-Intensity Test Reactor

The reactor was down several extra days this month while necessary shielding was being installed, and this increased the down time to 18.0%.

The power of the LITR was increased to 3000 kw on September 2 and has continued at this rate with no particular trouble, except for the higher radiation. This has been successfully reduced by more shielding around the exit water line, in the control

TABLE 1. USAGE OF EXPERIMENTAL FACILITIES – ORNL GRAPHITE REACTOR

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
1, north and south	4 × 4			Regulating rod
2, north and south	4 × 4			Regulating rod
3, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production
4, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous exposures of special samples
5, north and south	4 × 4			Shim rod
6, north and south	4 × 4			Shim rod
7, vertical	4 × 4			Safety rod
8, vertical	4 × 4			Safety rod
9, vertical	4 × 4			Safety rod
10, vertical	4 × 4	Solid State	J. H. Crawford	Low-temperature sample-exposure facility
11, vertical	4 × 4	Operations and Chemical Technology	J. P. McBride	Boron shot safety tube and HRP fuel studies (no samples during month)
12, vertical	4 × 4	Operations	J. A. Cox	General exposures of samples in water-cooled facility
13, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
14, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
15, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous large-sample exposures
16, north and south	4 × 4	Operations	J. A. Cox	Target exposures for radio-isotopes and research
17, north	4 × 4	Unassigned		Empty
17, south	4 × 4	Physics	E. O. Wollan	Neutron polarization
18, north and south	4 × 4	Operations	J. A. Cox	Miscellaneous
19, north and south	4 × 4	Solid State	O. Sisman	Water-cooled exposure facility
20, north	4 × 4			Graphite temperature thermocouples
20, south	4 × 4	Solid State	J. C. Wilson	Creep of metals (no samples during month)
21, north and south	4 × 4	Operations	J. A. Cox	Sulfur exposure for radio-phosphorus production
22, north	4 × 4	Unassigned		Empty

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
22, south	4 × 4	Operations	J. A. Cox	Two pneumatic tubes for general usage
30	9 × 9	Solid State (G.E.)	L. E. Stanford (G.E.)	Life tests of equipment in radiation (no tests during month)
31	9 × 9			Blocked by one end of air seal H beam across top of graphite
32	9 × 9			Contains chamber for high-power-level trip circuit
33	9 × 9			Contains chamber for high-power-level trip circuit
34	9 × 9			Contains chamber for No. 2 power-level galvanometer
35	9 × 9			Blocked by one end of air seal H beam across top of graphite
36	9 × 9			Contains chamber for high-power-level trip circuit
37	9 × 9	Training School	H. S. Pomerance	Contains chamber for reactor kinetics study
40	9 × 9			Contains chamber for No. 1 power-level galvanometer
41	6-in. dia			Rear wall suction pressure tap; hole into west plenum
42	6-in. dia			Unit pressure differential tap; hole into west plenum
43	6-in. dia			Unused (inaccessible); hole into west plenum
44	6-in. dia			Unused; hole into west plenum
45	6-in. dia			Gas discharge from hole 22 pneumatic tubes; hole into west plenum
46	6-in. dia			Used for viewing west end of graphite with periscope; vertical hole into west plenum
47	6-in. dia			Used for viewing west end of graphite with periscope; vertical hole into west plenum

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
50, north	4 × 4	Solid State	J. H. Crawford	General sample-exposure facility
50, south	4 × 4	Physics	E. O. Wollan	Neutron spectometer
51, north	4 × 4	Solid State	J. H. Crawford	Water-cooled U^{235} neutron converter
51, south	4 × 4	Physics	C. G. Shull	Neutron spectrometer
52, north	4 × 4	Solid State	J. H. Crawford	Facility for exposing samples at the temperature of liquid nitrogen
53	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
54	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
55	4 × 4	Solid State (G.E.)	L. E. Stanford (G.E.)	Half-hole for miscellaneous large-sample exposures
56, north	4 × 4	Physics	E. C. Campbell	Fast pneumatic tube
56, south	4 × 4	Physics	H. S. Pomerance	Oscillator for measuring neutron absorption cross sections
57, north	4 × 4	Training School	H. S. Pomerance	General purpose neutron collimator
57, south	4 × 4	Physics	S. Bernstein	Neutron polarization
58, north	4 × 4	Solid State	O. Sisman	Circulating loops for Na and NaK
58, south	4 × 4	Chemistry	H. Levy	Neutron spectrometer
59	4 × 4	Unassigned		Half-hole blocked by work at hole 17, south
60	4 × 4	Solid State	J. C. Wilson	Half-hole; transferred to Solid State during September 1953 (no samples during month)
61	4 × 4			Half-hole; general large-sample exposures
East animal tunnel				General exposures of large samples to low flux
West animal tunnel				General exposures of large samples to low flux
Thermal column		Physics		Used by several groups for low-level neutron flux work
Inclined animal tunnel in thermal column				Infrequent exposures of biological specimens

TABLE 1 (continued)

HOLE NUMBER AND ORIENTATION	DIMENSIONS (in.)	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
West core hole		Physics	E. P. Blizard	Lid tank for shielding studies
A	1.68-in. dia	Operations	E. E. Beauchamp	Charging-face hole containing 20 small cans of $CaCO_3$
B	1.68-in. dia	Solid State		Coaxial cable exposure
C	1.68-in. dia	Unassigned		Charging-face hole – empty
D	1.68-in. dia	Unassigned		Charging-face hole – empty
1768	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1867	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1968	1.75 in. square	Solid State	R. H. Kernohan	Charging hole containing neutron converter donut; used for general exposures of samples to fast-neutron flux
1069	1.5-in. dia	Unassigned		Charging hole containing an aluminum liner; used for general exposure of suitable samples
2079	1.5-in. dia	Operations	J. A. Cox	Charging hole containing pneumatic tube; used for exposure of research and radioisotope samples
0857, 0880, 1484, 1853, 2857, 2880				Charging-face holes containing boron-coated thermopiles for reactor instrumentation
Others				Seven uncharged peripheral holes contain $CaCO_3$ for radioisotope production; 409 uncharged peripheral holes remain unused

room, south of the pump area, and around the seal tank. Steel plates 1½ in. thick had been planned as additional shielding in some of the experimental rooms, but, at present, the experimental facilities have given a higher radiation background than that for the reactor shield itself; therefore, unless very low backgrounds are required for some experiments, the steel shielding will probably not be required.

Activity in the reactor water is now often above 200,000 counts/min/ml (measured on a scintillation counter), which is about double that previously experienced. Difficulty with the resin column has sometimes made it necessary to operate the water system without the use of the bypass demineralizer, and this has caused the activity in the water to increase somewhat.

A hot drain is being installed at facility HB-4 in connection with an experiment, and it is planned to extend the drain to the pump area so that the bypass resin columns can be regenerated in place and will not have to be moved for regeneration, as is the current practice.

A shutdown for one of the experiments in the LITR permitted measurement of poison buildup in the fuel following reactor shutdown. The buildup was found to be slightly in excess of 2% (based upon an old calibration of the No. 2 shim rod), which is in agreement with the approximate 2% indicated by calculations. This value is about 1.5% higher than when the power is at 1500 kw.

Because of the greater buildup of poison at 3000 kw, it is necessary to carry about 1.5% more excess reactivity in order that the reactor can be started up at any time. The normal shutdown on Tuesday lasts for about 12 hr, after which time the poison in the fuel is only about 0.2% below the maximum reached 8 hr after shutdown. The ability to carry enough excess reactivity to start up at any time adds considerable flexibility to the LITR and makes it possible to obtain data in certain experiments which could not have been gotten otherwise.

The third shipment of spent fuel elements was made to the Arco Chemical Processing Plant. Future shipments will probably be made by a truck which is making regularly scheduled runs between Arco and Oak Ridge.

The fuel elements now being installed in the LITR are of the 18-plate, thin sidewall type. Approximately six more will be fabricated from the remaining portion of the LITR quota for 1953, and these will be of the 19-plate, thin sidewall type. The total U^{235} in each element will still be approximately 168 grams.

The usage of experimental facilities in the LITR is indicated in Table 2.

FILTER HOUSE

Table 3 shows a comparison of the pressure drop across the exit air filters last month with the pressure drop this month and with that experienced with clean filters.

FAN HOUSE

The No. 2 fan bearings were inspected on September 21 and were found to be in satisfactory condition.

RADIOISOTOPES

Stringers 13, 14, and 16 contained 195 cans of target material at the end of September, as compared with 209 cans of target material at the end of August.

Table 4 shows a comparison of the radioisotope and research samples charged into the ORNL graphite reactor during September with those handled in August.

WATER-DEMINERALIZATION PLANT

The multiport valve on the No. 1 demineralizer was found to be leaking, and, during regeneration, this permitted caustic to enter and deplete the cation unit. The valve was repaired and now gives normal capacities of about 30,000 gal on the anion unit and 75,000 gal on the cation unit.

A comparison of the amount of water demineralized during September and August is given below:

	September 1953	August 1953
Water demineralized (gal)	423,060	418,560

TABLE 2. USAGE OF EXPERIMENTAL FACILITIES – LITR

FACILITY NUMBER	TYPE OF FACILITY	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
HB-1	6-in.-ID beam hole	Physics	E. D. Smith	Chopper-type neutron velocity selector
HB-2	6-in.-ID beam hole	Solid State (G.E.)	D. S. Billington	General exposures of large samples and loops
HB-3	6-in.-ID beam hole	Solid State	J. C. Wilson	Creep of metals
HB-4	6-in.-ID beam hole	Chemistry	G. H. Jenks	Empty
HB-5	6-in.-ID beam hole	Chemistry	H. F. McDuffie	HRP fuel stability and corrosion tests
HB-6	6-in.-ID beam hole	Chemistry	H. F. McDuffie	HRP fuel stability and corrosion tests
HR-1	Pneumatic tube	Operations	J. A. Cox	General short exposures of research and radioisotope samples
HR-2	Pneumatic tube	Operations	J. A. Cox	General short exposures of research and radioisotope samples
C-28	Hollow fuel element in core	Solid State	T. H. Blewitt	Exposure of metal crystals to high, fast flux
C-38	Hollow fuel element in core	Solid State	J. B. Trice	Exposure of specimens for flux determination methods
C-42	Hollow Be core piece with access tube from top plug	Solid State (G.E.)	L. E. Stanford (G.E.)	Exposure of miscellaneous small specimens
C-44	Hollow Be core piece with access tube from top plug	Chemistry	H. F. McDuffie	Empty
C-46	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	ANP fuel tests
C-48	Hollow Be core piece with access tube from top plug	Solid State	G. W. Keilholtz	ANP fuel tests
C-53	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-57	Mg tray in core space	Operations	J. A. Cox	Exposures of research and radioisotope samples
C-59	Be core piece with four vertical holes	Operations	J. A. Cox	Exposures of research and radioisotope samples

TABLE 2 (continued)

FACILITY NUMBER	TYPE OF FACILITY	DIVISION ASSIGNED TO	PERSON IN CHARGE	TYPE OF EXPERIMENT OR USAGE
V-1	Inclined low-flux hole			Contains boron-coated thermopile for reactor instrumentation
V-2	Inclined low-flux hole	Analytical Chemistry	G. W. Leddicotte	Exposure facility for activation analyses
V-3	Inclined low-flux hole	Unassigned		Empty
V-4	Inclined low-flux hole	Unassigned		Empty

TABLE 3. PRESSURE-DROP DATA

DATE	PRESSURE DROP (in. water gage)		
	Glass Wool	CWS No. 6	Total Across House
9/30/53	2.8	2.5	6.4
8/31/53	2.5	2.7	6.4
Clean filters	1.1	1.3	3.3

TABLE 4. RADIOISOTOPE AND RESEARCH SAMPLES

	SEPTEMBER 1953		AUGUST 1953	
	Research	Radioisotopes	Research	Radioisotopes
Stringers 13, 14, 16	10	133	9	204
Hole 22	40	10	62	14
All other holes	4	22	2	30
Total by groups	54	165	73	248
Total for month	219		321	

CHEMICAL SEPARATIONS AND RADIOISOTOPE DEVELOPMENT DEPARTMENTS

RADIOISOTOPES

Iodine (I^{131} – 8 d)

Ninety-eight ORNL slugs were processed this month and yielded 57,609 mc of I^{131}. The product of the last six runs was only 42% of normal, and no reason has yet been found for this low yield. The I^{131} is not coming out of the UNH in the first distillation step, but it is doubtful that the difficulty will be found until the cell can be decontaminated and the equipment inspected.

Iodine Development Work, Building 3028

The following I^{131} equipment was received from vendors during September: a primary still, dissolver reflux condensers, a gas-scrubbing column, and the instrument panel board. All equipment has now been delivered, and vessel placement is 95% complete. Piping was finished on the two dissolvers and the front face of cell 2. Installation of all piping is 60% complete; the total installation is 40% complete.

Phosphorus (P^{32} – 14.3 d)

Nineteen 2500-g cans of bombarded sulfur were processed and yielded 14,914 mc of P^{32}. All runs were satisfactory.

At the end of the month, the products were being shipped in hydrochloric acid solution instead of in nitric acid solution.

Fission-Product Precipitation Process, Building 3515

Preparations for starting chemical test runs on October 8 in the precipitation process have been completed.

Helium (He^3 – Stable)

The He^3 which had been placed in a neutron counter tube for the Physics Division was removed, passed through another purification cycle, and assayed. No radioactivity could be detected in the finished preparation, and the mass spectrographic analysis showed that it contained >97% He^3 and that the remainder was He^4. The unexpected results obtained by the Physics group in using the neutron counter were apparently not caused by impurities in the He^3.

Krypton and Xenon (Kr^{85} – 9.5 y; Xe – Stable)

A cylinder of concentrated off-gases was received from Arco. Preparations were made for passing this gas through the low-temperature fractionating column for separation of the components. It is believed that about 100 curies of Kr^{85} are available in the crude gas mixture.

Zirconium Targets

Developmental work was completed on the preparation of thick zirconium targets by the method reported last month, namely, brazing of the zirconium onto tungsten by use of a thin layer of iron evaporated onto the tungsten as a bonding agent. The targets produced are believed to be superior to those made by other methods which have been reported in the literature. Some metallographic work is being done by the Analytical Chemistry Division microscopists to determine the nature of the intermetallic joint.

Processed Radioisotope Production

Table 5 is a list of radioisotope product solutions that were prepared during September.

Special Preparations

The following special preparations were made:

	Number	Total Amount
Co^{60} sources	24	1,332 mc
Cs^{134} source	1	200 mc
H^3 ampoules	4	310 mc
$Zr\text{-}H^3$ targets	12	37,890 mc
A^{37} ampoules	2	7 mc
He^3	5	15 cc

Miscellaneous Work

The construction of underground storage space for irradiated Be_3N_2 slugs was completed.

Installation of Corning high-density glass to replace the $ZnBr_2$ solution in the viewing window of the remote manipulator cell was completed.

Six spheres of cobalt metal 0.15 mm in diameter were fabricated for irradiation. These extremely minute spheres will be used by a customer in studies on fluid-flow catalysts.

TABLE 5. RADIOISOTOPES PRODUCED DURING SEPTEMBER

PRODUCT SOLUTION	SOURCE	AMOUNT (mc)	SPECIFIC ACTIVITY (mc/g)
Calcium (Ca^{45} – 152 d)	Hanford reactors	420	21.7
Carbon (C^{14} – 5470 y)	Hanford reactors	1490	18.7%*
		1994	20.0%*
Chlorine (Cl^{36} – 4.4×10^5 y)	Hanford reactors	28.72	0.348
Iron (Fe^{55} – 2.91 y)	Hanford reactors	57	974
		35.5	871
		145	21.0
Iron (Fe^{59} – 46.3 d)	LITR	41	2230
	Hanford reactors	54	7.88
Mercury (Hg^{203} – 43.5 d)	LITR	342	190
		762	173
Ruthenium (Ru^{106} – 1.0 y)	Fission products, ORNL graphite reactor	1905	Carrier-free
Sodium (Na^{24} – 14.9 h)	LITR	3260	5000
		3610	5600
Strontium (Sr^{89} – 53 d)	Fission products, ORNL graphite reactor	171	Carrier-free
Strontium (Sr^{90} – 25 y)	Fission products, ORNL graphite reactor	2399	Carrier-free

*Isotopic ratio.

The machining of stainless steel windows for Sr^{90} sources to thicknesses of <5 mils was found to be difficult. However, very good source holders were machined from types R and K monel with windows 2 mils thick.

The problem of securing good welds on the can used for targets to be irradiated in the MTR was solved by increasing the wall thickness to $\frac{1}{16}$ in. and by encouraging strict adherence to the original welding specifications.

The transfer of cobalt from the canal to the storage garden has been started.

Lithium carbonate containing 1 mc of C^{14} was prepared for the Physics Division; 50 g of special low-specific-activity $BaC^{14}O_3$ was prepared for the University of Michigan.

RADIOACTIVE-WASTE DISPOSAL

A total of 32,400 gal of chemical-waste concentrate bearing 899 curies of beta activity was transferred from waste-tank W-8 to chemical-waste storage pit No. 2. The total transferred to date is 205,200 gal containing 7149 curies of beta activity.

Work was resumed on the replacement of valve group No. 1 in the north tank farm.

Complete corrosion data have been received for the test coupons which were removed from the stainless steel waste-monitoring tanks in June 1953. The results show that the corrosion rate is presently low enough so as not to cause any concern. However, an inspection of the corrosion coupons that had been installed as recently as July 29 in tank WC-5, which services Building 3508, revealed that the coupons had again disappeared into the tank. The loss occurred when the suspended stainless steel cable corroded completely and failed. New coupons are being fabricated and will be installed so that they are suspended on a chemically inert plastic tape to eliminate the frequent coupon loss. Meanwhile, a sample of the liquid content of tank WC-5 has been submitted for analysis to determine, if possible, the cause of such rapid corrosion of the suspended cables.

The Cottrell precipitator was shut down for 2 hr this month to repair the overflow liquid-level probe on the washdown tank, to replace a burned out rectifier tube, and to clean up the tubes and relays of the high-voltage section.

Waste Discharged to White Oak Creek

A total of 11.37 curies of beta activity was discharged to White Oak Creek from the settling basin and the retention pond (see Table 6); this discharge is only 81% of that of last month. Some of the discharge resulted from washing the Building 3505 storage canal to the settling basin on September 15 and from some of the chemical-waste evaporator foam-overs which reached the settling basin.

Chemical-Waste Evaporator

The concentrate discharge line from the waste-evaporator tank to the concentrate storage tank W-6 plugged with solidified concentrate. In an attempt to unplug the line by use of high-pressure steam, a gasket on the discharge side of the drain valve was blown out. A 33-hr shutdown was required for decontamination of the waste evaporator and for making the necessary repairs. The waste-evaporator operations were also difficult this month as a result of the several foam-overs. Evaporator operation is shown in Table 7; waste-tank inventory is shown in Table 8.

TABLE 6. ACTIVITY DISCHARGED TO WHITE OAK CREEK

DISCHARGED FROM	SEPTEMBER 1953		AUGUST 1953	
	Gallons	Beta Curies	Gallons	Beta Curies
Settling basin	20,258,000	10.69*	21,701,000	13.04
Retention pond	347,000	0.68	393,000	0.98
Total	20,605,000	11.37	22,094,000	14.02

*Less than 0.11 curie contributed by the waste evaporator.

TABLE 7. WASTE-EVAPORATOR OPERATION

MONTH	SOLUTION FED TO EVAPORATOR (gal)	CONCENTRATE TO W-6 (gal)	VOLUME REDUCTION	BETA CURIES TO EVAPORATOR	BETA CURIES TO SETTLING BASIN
September 1953	174,717	16,087*	10.86:1	6611	0.11**
August 1953	212,631	24,076	8.83:1	2757	3.04

*The concentrate of two runs, 1044 gal, was jetted back to W-5 and is not included in this figure because the drain line from the waste evaporator to concentrate tank W-6 was plugged.

**This figure is considered to be too low because some foam-overs escaped to the settling basin without being sampled.

Waste-Tank Inventory

TABLE 8. WASTE-TANK INVENTORY

TANKS	CAPACITY (gal)	FREE SPACE (gal)	
		September 1953	August 195[illegible]
Hot-Pilot-Plant Storage			
W-3, 13, 14, 15	48,500	32,500	32,320
Chemical-Waste Storage			
W-5	170,000	74,000	89,000
Evaporator-Concentrate Storage			
W-6, 8	340,000	102,500	89,000
Metal-Waste Storage			
W-4, 7, 9, 10	543,000	313,000	296,000

RaLa (Ba^{140} – 12.5 d)

"Crud" filter No. 2 was decontaminated and repaired by repacking the valves and by providing new disconnect gaskets. The gaskets used with this filter are made of polythene, whereas Teflon gaskets are used with "crud" filter No. 1. Close observation will be made of these two gasket materials to determine which is more adaptable to the high radiation levels encountered. After the filter was reinstalled and tested for leaks, the "crud" filter shielding blocks were installed and aligned, and the "crud" filter cubicle is now ready for operation.

A micrometallic filter was placed in the inlet air line to the charging head in order that any contaminants from the hot-air heater would be prevented from reaching the product. The pressure drop across this filter is equivalent to 0.4 in. H_2O and will have no adverse effect on operation of the drying equipment.

After the air filter and attached piping were insulated, it was noted that the required inlet air temperature of 350°C to the charging heads could not be reached without exceeding the maximum permissible operating temperature of the electric air heater. The excessive heat loss is the result of either an improper choice of insulation for this operation or the increased surface of the additional equipment, even though it is insulated. The insulation will first be replaced in an attempt to solve this problem; if this fails, the piping will be rearranged to provide less exposed surface for reducing the heat loss.

The next RaLa run has been postponed until some time in November 1953.

RADIOISOTOPE SALES DEPARTMENT

Radioisotope shipments made during September 1953 are compared in Table 9 with those made during August 1953 and September 1952. A breakdown according to separated and unseparated material (including totals for August 1946 through September 1953) and for project, nonproject, and foreign shipments is also shown.

HANFORD IRRADIATIONS

The radioisotope samples listed in Table 10 were received from Hanford during the month.

CYCLOTRON RADIOISOTOPES

Two targets, one containing Be^7 and one containing $As^{73,74}$, were received from the ORNL 86-in. cyclotron during the month.

ACTIVATION ANALYSES

A total of 132 requests for information concerning activation analyses has been received; 50 have developed into requests for analyses, 39 of which have been completed.

TABLE 9. RADIOISOTOPE SHIPMENTS

	SEPTEMBER 1953	AUGUST 1953	SEPTEMBER 1952	AUGUST 1946 TO SEPTEMBER 1953, INCLUSIVE
Separated material	777	759	703	38,259
Unseparated material	165	228	167	10,254
Total	942	987	870	48,513
Nonproject	825	840	767	
Project	97	103	88	
Foreign	20	44	15	
Total	942	987	870	

TABLE 10. RADIOISOTOPES RECEIVED FROM HANFORD

SAMPLE NUMBER	MATERIAL	NUMBER OF PIECES	DATE DISCHARGED	DATE RECEIVED
ORNL-146	Cobalt	5	9/2/53	9/29/53
ORNL-147	Normal iron oxide	1	August 1953	9/15/53
ORNL-148	KCl	2	August 1953	9/29/53
ORNL-158	Antimony	2	August 1953	9/29/53
ORNL-161	Iron oxide	1	August 1953	9/15/53
ORNL-162	Iridium	1	August 1953	9/29/53
ORNL-165	Calcium carbonate	4	August 1953	9/29/53

SF MATERIAL CONTROL

One shipment consisting of 2[illegible] drums containing depleted UNH solutions was sent to Mallinckrodt Chemical Works, St. Louis, Missouri, during the month. The total uranium content of the 28 drums was 2280 kg. Five shipments consisting of 145 drums containing depleted UNH solutions were sent to Carbide and Carbon Chemicals Company, Y-12. The total uranium content of the 145 drums was 11,967 kg. These shipments, numbered 22 through 27, were of uranium recovered under the Metal Recovery Program and make a total of 60,573 kg shipped to date.

During September, 35 fuel assemblies and 2 shim safety-control rods were shipped to the Phillips Petroleum Company, Scoville, Idaho. This makes a total of 545 fuel assemblies and 56 control rods shipped to date.

A total of 3.48 kg of contained U^{235} in the form of metal was received from Y-12 to be used in fabricating modified MTR fuel plates for ANL.

The third shipment of spent LITR and BSR radioactive fuel elements was made during September to American Cyanamid Company, Scoville, Idaho, for recovery. The shipment consisted of five LITR fuel assemblies, one partial LITR fuel assembly, and one BSR fuel assembly.

One carload-lot shipment consisting of a silver-bed reactor for the Chemistry Division was received from Hanford.

During September, the SF Accountability Control Office prepared and submitted the special reactor materials requirements of the Laboratory for the three-year period beginning January 1, 1[illegible]4, subdivided by quarter years. In addition, work was essentially completed on two other major reports, namely, ORNL X-10 and ORNL Y-12 basic and special quota requirements for CY 195[illegible], and a 20-page report on the estimated fissionable materials to be diverted from production channels during FY 1954. These two reports will be submitted early in October; their preparation has caused a temporary delay in preparing the *SF Accountability Manual*. In order to meet the November 15 deadline for issuing the manual, it is likely that overtime work will be required.

SF surveys during the month consisted in auditing the records of three analytical laboratories. Results of the audit disclosed that all records were in good order and that proper accounting had been made for all samples.

During september, there were 22 receipts and 37 outgoing shipments, compared with 16 receipts and 35 shipments last month. Tables 11 and 12 are summaries of receipts and shipments for September.

TABLE 11. SF MATERIALS RECEIVED

FROM	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
Battelle Memorial Institute, BMI	Thorium	1	2,04[illegible]
Carbide and Carbon Chemicals Co., K-25, CCC	U^{233}	1	0.[illegible]02
	Depleted uranium	1	8[illegible]
Carbide and Carbon Chemicals Co., Y-12, CYT	Enriched uranium	3	3,50[illegible]
	Normal uranium	4	457,87[illegible]
	Plutonium	1	Negligible
	Depleted uranium	1	[illegible]35
	U^{233}	1	10[illegible]
General Electric Co., HGE	Depleted uranium	1	3[illegible]
Iowa State College, ISC	Normal uranium	1	5[illegible]
Los Alamos Scientific Laboratory, SFC	Depleted uranium	1	1.25
North American Aviation, Inc., DNA	Normal uranium	4	141.00
Phillips Petroleum Co., MTI	Enriched uranium	1	0.10
	Thorium	1	6,62[illegible]

TABLE 12. SF MATERIALS SHIPPED

TO	MATERIAL	NUMBER OF SHIPMENTS	AMOUNT (g)
American Cyanamid Co., CPI	Enriched uranium	1	779.42
Battelle Memorial Institute, BMI	Normal uranium	1	2.17
Carbide and Carbon Chemicals Co., K-25, CCC	Depleted uranium	1	640.35
Carbide and Carbon Chemicals Co., Paducah, CKY	Plutonium	1	Negligible
Carbide and Carbon Chemicals Co., Y-12, CYT	Depleted uranium	6	11,966,685.00
	Normal uranium	3	1,193.06
	Enriched uranium	6	160.79
	Plutonium	3	0.12
	U^{233}	1	0.10
Mallinckrodt Chemical Works, MCW	Depleted uranium	1	2,280,168.00
North American Aviation, Inc., DNA	Normal uranium	1	20.00
	Depleted uranium	1	400.81
	Plutonium		0.01
Phillips Petroleum Co., MTI	Enriched uranium	9	6,151.02
USAEC, Oak Ridge Operations Office, CPA	Normal uranium	1	50.00
Westinghouse Electric Corp., WEM	Normal uranium	1	171.00